15. DECISION SCREENING

15.1 METHODOLOGY

For the Fall Creek Evaluation Study, C*riterium Decision Plus* (CDP) software was used to assist in the evaluation of alternatives. CDP is a decision management tool that was used to organize, complete and communicate complex decision-making tasks. Once criteria were developed, the program was used in a workshop setting to confirm the weightings with the aid of the stakeholders and apply them to the alternatives. Based on input from the stakeholders during the workshop, non-cost evaluation factors, subfactors and their weighting factors were determined and scores for the various alternatives were calculated. Following this process, preliminary costs for each of the alternatives were compared against the CDP weighted results in graphic form.

The approach for making decisions using CDP was broken into seven steps. The first step in the process was to define the issue and to determine the best alternatives to meet the objective. Factors that influence the decision were also identified. The second step was to identify the stakeholders and apply their knowledge to support the decision making process. The third step involved identifying all the factors to be considered in the decision, often called brainstorming. The fourth step was the development of the decision structure including identifying the goal, factors or criteria important for satisfying the goal, identifying sub-criteria under each criterion, and expanding the hierarchy to encompass each level of understanding to the alternatives level.

The importance of each criterion was weighted as a basis of comparison. Once the decision structure was developed, the fifth step involved evaluating the alternatives against the criteria. The sixth step included finalizing the decision by performing a sensitivity analysis, making modifications as necessary and recalculating the results. The final step involved documenting the results of the decision making process. The documenting process, as described in Section 15.2 below, allows interested parties to review the justification for the decision. It will also allow for future modifications if revisions are required.

15. DECISION SCREENING

15.2 CRITERIA

The criteria used to develop the CDP model for each project component was based on typical factors involved in public works projects, as well as specific factors related to each project component. Typical criteria used in developing the CDP model included population impacts, site access, constructability, operations and maintenance, impacts on green space, environmental contamination risk, aesthetics and permitting. In addition to the main criteria selected, sub-criteria and associated factors also were developed. The inclusion of sub-criteria and associated factors allowed for more detailed evaluation of the specific components to the main criteria. For each evaluated project component, detailed tables were developed with criteria and appropriate weighting factors (Appendix J).

15.3 RESULTS OF SCREENING

Detailed tables for each project component to be evaluated were prepared prior to developing the CDP model. Once the CDP model was developed, preliminary results of weighted non-cost factors were discussed and modified at two project workshops with input from the stakeholders. Based on the overall scores of the weighted non-cost factors for each alternative, rankings were developed for the alternative. As a final component of the decision screening process, preliminary costs for each alternative were compared on a graph against results of the weighted non-cost factors, which is called the cost-benefit ratio.

The cost-benefit ratio is determined by dividing the present worth cost (dollars) by the decision score (unitless). The resultant ratio is presented in dollars. The lower the cost-benefit ratio, the more favorable the alternative. This is then compared to the decision score and present worth cost independently. The cost-benefit ratio provides an indicator of favorability considering both cost (present worth) and non-cost (decision score) factors.

For each project component evaluated, the detailed weighted criteria table, CDP modeling results based on the weighted factors, and cost/benefit comparisons in

15. DECISION SCREENING

graphic format were prepared. The cost/benefit analysis indicates a more favorable result if the:

- Decision Score ranks high on the 0-1 scale
- Present Worth Costs are lower
- Cost/Benefit Ratio is lower compared to the other alternatives.

Overall results of the decision screening process are summarized herein.

15.3.1 Tunnel Alignment

Three alignment alternatives were evaluated for the main tunnel as part of this project: West, Central and East. As presented in Appendix J-1 – Tunnel Alignment, alignment alternatives were weighted based on several criteria provided in tabular form. These criteria weights were modeled using CDP to develop decision scores based on non-cost factors. To determine which alternative is the most preferred, the present worth cost and cost/benefit ratio for each alternative was compared to the CDP decision score. As presented in Figure 15.1, the West alignment alternative is rated as the most preferred considering it has the lowest present worth cost and the lowest cost/benefit ratio as compared to the other alternatives. The non-cost decision score between the West and East alignments indicates that the East would be slightly more favorable if costs were not a factor.

15.3.2 Working Shaft

Three working shaft alternatives were evaluated as part of this project: Reilly shaft, Southern Avenue shaft and Bluff Road shaft. As presented in Appendix J-2 – Working Shaft, the working shaft alternatives were weighted based on several criteria provided in tabular form. These criteria weights were modeled using CDP to develop decision scores based on non-cost factors. To determine which alternative is the most preferred, the present worth cost and cost/benefit ratio for each alternative was then compared to the CDP decision score. As presented in Figure 15.2, the Bluff

15. DECISION SCREENING

Figure 15.1

15. DECISION SCREENING

Figure 15.2

15. DECISION SCREENING

Road shaft alternative is rated as the most preferred considering it has the highest non-cost decision score, the lowest present worth cost, and the lowest cost/benefit ratio as compared to the other alternatives.

15.3.3 Retrieval Shaft

Two retrieval shaft alternatives were evaluated as part of this project: Sutherland Avenue shaft and Keystone Dam shaft. As presented in Appendix J-3 – Retrieval Shaft, the retrieval shaft alternatives were weighted based on several criteria provided in tabular form. These criteria weights were modeled using CDP to develop decision scores based on non-cost factors. To determine which alternative is the most preferred, the present worth cost (retrieval shaft costs are included with the main tunnel costs) and cost/benefit ratio for each alternative was then compared to the CDP decision score. As presented in Figure 15.3, the Sutherland Avenue shaft alternative is rated as the most preferred considering it has a higher non-cost decision score, and a lower cost/benefit ratio as compared to the other alternative. While the Sutherland Avenue shaft alternative does have a higher overall present worth cost when factored in with the West Tunnel alignment costs, the non-cost factors such as impacts to well fields indicate that the lowest present worth cost alternative (Keystone Dam) is not the most preferred.

15.3.4 Force Main

Six force main alignment alternatives were evaluated for conveying treated effluent from the Belmont AWT Plant to the Keystone Dam on Fall Creek including discharge points at Pogues Run and Pleasant Run for the Flow Augmentation System. They are identified as Alternative 1, Alternative 4A, Alternative 4B, Alternative 5A, Alternative 5B, and Alternative 6. Information on four alignments is included in Section 12 – Force Main Alternatives. The *Preliminary Alternatives Memorandum* identified two other alternatives, Alternatives 2 and 3, which were removed from consideration during the course of this project. Each of the alignments was evaluated based on the non-cost and cost-related factors for construction of the force

15. DECISION SCREENING

Figure 15.3

15. DECISION SCREENING

main. As presented in Appendix J-4 – Force Main, the alternatives were weighted based on several criteria provided in tabular form. These criteria weights were modeled using CDP to develop decision scores based on non-cost factors. To determine which alternative is the most preferred, the present worth cost and cost/benefit ratio for each alternative was then compared to the CDP decision score. As presented in Figure 15.4, Alternative 4A or 4B is rated as the most preferred alternative based on non-cost factors, but Alternative 5A or 5B has a similar present worth costs and cost/benefit ratio. The primary difference between Alternatives 4A and 4B and Alternatives 5A and 5B is that Alternatives 5A and 5B involves use of the Monon trail or adjacent railway for placement of the force main, as well as uses a portion of the Conrail railroad. Based on additional input from project stakeholders and the public, any of the four alternatives (4A, 4B, 5A, or 5B) could be determined to be the most preferred. However, for the purpose of this study and based on stakeholder input, Alternative 4B was determined to be the preferred option because it involves less use of the Monon trail or nearby railways that may be difficult to permit for a force main burial project.

15.3.5 Fall Creek Outfall Structure

The following four Fall Creek Outfall Structure alternatives were evaluated as part of this project for the Keystone Dam location.

- Stair-step cascade aerator structure
- Side-stream cascade aerator structure
- Side-stream cascade aerator structure with small constructed wetland (not for nutrient removal)
- Side-stream aerator structure alternative (i.e., large rocks) with small constructed wetland (not for nutrient removal)

As presented in Appendix J-5 – Outfall Structures, the outfall structure alternatives were weighted based on several criteria provided in tabular form. These criteria weights were modeled using CDP to develop decision scores based on non-cost factors. To determine which alternative is the most preferred, the present worth cost

15. DECISION SCREENING

Figure 15.4

and cost/benefit ratio for each alternative was then compared to the CDP decision score. As presented in Figure 15.5, the large rocks with small constructed wetland alternative has the lowest present worth cost and is the preferred alternative, but it does not have the lowest cost/benefit ratio or non-cost score as compared to the other alternatives. However, it has been indicated by some of the project stakeholders that the added aesthetic benefit of the wetland area would have a positive benefit. The non-cost decision score indicates that the side-stream cascade aerator structure alternative would be most favorable if costs were not a factor.

15.3.6 Pogues Run Outfall Structure

The following four alternatives were evaluated for Pogues Run Outfall Structures as part of the overall flow augmentation project. Unlike Fall Creek, Pogues Run was evaluated at different locations instead of being evaluated on different aeration structures. For the evaluation it was assumed that a side-stream cascade aeration structure alternative (i.e., large rocks) would be installed at the end of the force main. The following four locations were evaluated:

- Alternative 1 - Brookside Park
- Alternative 2 - Forest Manor Park
- Alternative 3 - Outfall to existing stormwater detention basin near I-70 and Emerson Avenue
- Alternative 4 - Inlet to existing stormwater detention basin near I-70 and Emerson Avenue

As presented in Appendix J-6 – Outfall Structures, the location alternatives were weighted based on several criteria provided in tabular form. These criteria weights were modeled using CDP to develop decision scores based on non-cost factors. To determine which alternative is the most preferred, the present worth cost and cost/benefit ratio for each alternative was then compared to the CDP decision score. As presented in Figure 15.6, the side-stream cascade aeration structure alternative (i.e., large rocks) at the inlet to existing stormwater detention basin near I-70 and

15. DECISION SCREENING

Figure 15.5

15. DECISION SCREENING

Figure 15.6

15. DECISION SCREENING

Emerson Avenue (Alternative 4) has the lowest present worth cost, cost/benefit ratio, and non-cost score as compared to the other alternatives.

15.3.7 Pleasant Run Outfall Structure

The following six alternatives were evaluated for Pleasant Run Outfall Structures as part of the overall flow augmentation project. Like Pogues Run, Pleasant Run was evaluated at different locations and it was assumed that a side-stream cascade aeration structure alternative (i.e., large rocks) would be installed at the end of the force main. The following six locations were evaluated:

- Alternative 1 - Christian Park
- Alternative 2 - Ellenberger Park
- Alternative 3 - Pleasant Run Golf Course
- Alternative 4 - Pleasant Run Parkway between 10th St. and 16th St.
- Alternative 5 - Shadeland Avenue and 21st Street
- Alternative 6 - Pleasant Run intersection with Conrail south of 30th St.

As presented in Appendix J-6 – Outfall Structures, the location alternatives were weighted based on several criteria provided in tabular form. These criteria weights were modeled using CDP to develop decision scores based on non-cost factors. To determine which alternative is the most preferred, the present worth cost and cost/benefit ratio for each alternative was then compared to the CDP decision score. As presented in Figure 15.7, the side-stream cascade aeration structure alternative (i.e., large rocks) at Shadeland Avenue and 21st Street (Alternative 5) has the lowest present worth cost, cost/benefit ratio, and non-cost score as compared to the other alternatives.

15. DECISION SCREENING

INSERT FIGURE 15.7